



⑪ Publication number:

0 061 918
A1

⑬

EUROPEAN PATENT APPLICATION

⑪ Application number: 82301628.0

⑪ Int. Cl.³: G 02 C 13/00

⑫ Date of filing: 29.03.82

⑬ Priority: 27.03.81 JP 44778/81

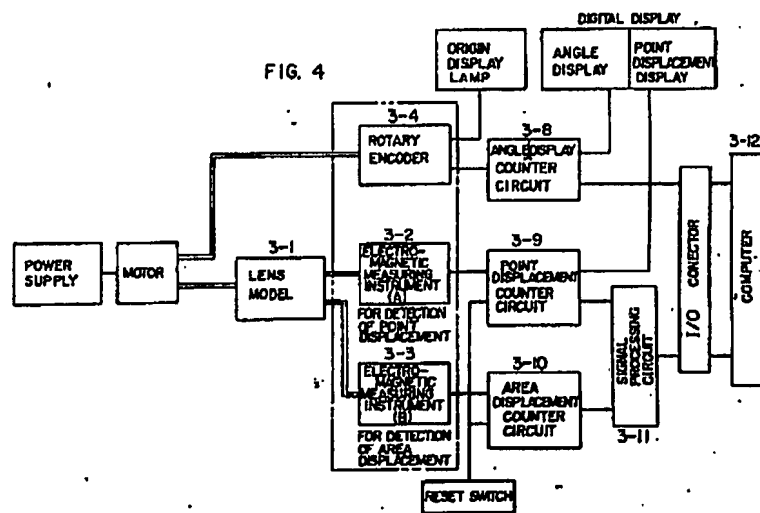
⑭ Date of publication of application:
06.10.82 Bulletin 82/40⑮ Designated Contracting States:
BE DE FR GB IT NL SE⑰ Applicant: Hoya Lens Corporation
25, Kowada Itukaichi-machi Nishitama-gun
Tokyo(JP)⑱ Inventor: Akaba, Hayao
18-12, Hattimacho-2-chome
Akishima-shi(JP)⑱ Inventor: Wada, Toyoji
1050, Itukaichi, Itukaichicho
Nishitama-gun Tokyo(JP)⑱ Inventor: I, Tadao
2913-7-326, Naramachi
Midori-ku Yokohama(JP)⑱ Inventor: Namatame, Hideo
105-7, Yano
Ome-shi(JP)⑲ Representative: Blanco White, Henry Nicholas et al,
ABEL & IMRAY Northumberland House 303-308 High
Holborn
London WC1V 7LH(GB)

⑳ Method of manufacturing spectacles.

㉑ Method of manufacturing spectacles having lenses which can be fitted in a frame suited for a user in accordance with an automatic design program prepared in consideration of recipe prescribed for the user. The recipe is first incorporated in an automatic lens program. Next, information of a selected frame is obtained from a proper lens model (1-4, 2-4) and processed by a computer (3-12) to thereby design an optimum lens. Subsequently, a raw lens material is subjected to cutting, abrading and the like processing in accordance with the results obtained from the processing by the computer (3-12). The finished lenses are then fitted in the frame to thereby fabricate the spectacles fitted with the lenses having a minimum edge thickness and held by the desired frame.

EP 0 061 918 A1

./...



- 1 -

0061918

METHOD OF MANUFACTURING SPECTACLES

1 The present invention relates in general to a
method of manufacturing spectacles. In more particular,
the invention concerns a method of fabricating glasses
or spectacles which method includes steps of measuring
5 a lens model or pattern representative of shape and size
of a frame of the spectacles in which finished lens
is to be fitted, inputting the information of the lens
model or pattern and optometrial information prescribed
by an ophthalmologist or eye doctor into a computer
10 for processing both informations in accordance with a
predetermined automatic lens designing program, preparing
the lens on the basis of the design data or processing
information thus obtained by cutting, abrading and/or
the like processing, and fitting the lens thus finished
15 in the frame of spectacles.

In order to realize spectacles or glasses in
accordance with recipe prescribed by ophthalmologist or
eye doctor so that the spectacles assure comfortableness
and proper visual aid to the user, precise information
20 of the frame of spectacles is indispensable in addition
to the recipe prescribed by the eye doctor.

Heretofore, lens material for spectacles are
in a circular form and labelled with outer diameters
for facilitating commercial handlings. The lens
25 material is profiled so as to be fitted in a selected

- 2 -

0061918

1 frame. Hitherto known method of preparing lenses for fitting it in the selected frame suffers various shortcomings among which the following can be mentioned.

1) Extra portion of the lens material which
5 has to be removed for preparing a specific lens is also prepared optically effective.

2) A convex lens made from the lens material tends to present an edge thickness which is not suited for being fitted in the frame. In other words, the
10 prepared lens often present, the edge thickness which is not optimum for fitting the lens in the frame.

When a lens or frame model (pattern) copying the shape and size of the lens to be prepared is used, following advantages can be involved.

- 15 a) Lens can be manufactured with a high yield.
b) Reduction of stocked lens materials (i.e. raw lens) can be attained.
c) Spectacles can be realized in light weight.
d) Costs can be reduced.

20 Accordingly, it is first intended with the present invention to obtain the information of a selected frame by measuring with precision a corresponding lens or frame model or pattern. The lens is then prepared in accordance with the frame information and the recipe
25 prescribed by eye doctor so that the lens of a minimum edge thickness can be snugly fitted in the selected frame, to thereby assure light weight of the assembled spectacles.

- 3 -

0061918

- 1 In the manufacture of the spectacles, lens materials or raw lenses having curved faces presenting predetermined powers and predetermined diameters (e.g. 60 mm, 65 mm and 70 mm) are preparatorily stocked.
- 5 For preparation of the lens, a selected one of the raw lenses is profiled by using a lens model suited for the frame selected by the user and assembled in the frame. However, the lens processed according to the hitherto known method tends to present a great edge thickness,
- 10 have a heavy weight and is lacking in smartness. Thus, the finished spectacles can not always assure comfortableness for the user.

- Accordingly, an object of the present invention is to provide a method of preparing lens for spectacles
- 15 which is evaded from the drawbacks of the hitherto known lens preparation by introducing a process of measuring the configuration and size of a frame selected by user and processing the measurement information as well as optometrical information with the aid of a
- 20 computer, to thereby realize the lens of minimum edge thickness and hence the spectacles of light weight and smartness.

- According to a first aspect of the invention, there is provided a method of manufacturing a lens for
- 25 spectacles on the basis of an automatic designing program prepared in accordance with a recipe which comprises steps of preparing an automatic lens design program in accordance with a prescription for a user,

- 4 -

0061918

- 1 obtaining frame information of a desired frame in which finished lenses are to be fitted on the basis of a lens model, deriving optimum lens design data through processing of the frame information by computer in accordance with the lens design program, and preparing and finishing a lens by cutting, abrading or the like processing of a lens material in accordance with the optimum lens design data.

- According to a second aspect of the invention,
- 10 there is provided a method of manufacturing lenses to be fitted in a frame of spectacles on the basis of an automatic design program prepared in accordance with a recipe prescribed for a user which comprises steps of preparing first the automatic design program in accordance with the recipe prescribed for the user, obtaining information of a lens frame from a lens model, processing the frame information in accordance with the automatic lens design program by a computer to thereby make available optimum lens design information, and processing
- 15 a lens in accordance with the optimum lens design information by cutting and abrading a raw material of the lens.

- According to a third aspect of the invention, there is provided a method of manufacturing spectacles
- 25 on the basis of an automatic design program prepared in accordance with a recipe prescribed for a user which comprises steps of preparing first an automatic lens program in accordance with recipe prescribed for the

- 5 -

0061918

- 1 user, obtaining desired information of a frame in which
the lenses are fitted with the aid of a lens model,
designing optimum lenses by processing the frame
information in accordance with the program by a computer, .
5 processing a lens material in accordance with data
available from the output of the computer, and fitting
the finished lenses in the frame.

Other objects, features and advantages of the
present invention will become more apparent from the
10 following description of preferred embodiments thereof
taken in conjunction with the accomapnying drawings, in
which:

Fig. 1 is a view to illustrate a process of
preparing a lens according to a hitherto known adjust-
15 ing method;

Fig. 2 is a view to illustrate a process of
preparing a lens in accordance with a method of the present
invention;

Fig. 3 is a view to illustrate schematically
20 a structure of an apparatus for measuring a lens model
used in carrying out the method of preparing a lens of
glasses or spectacles according to the invention; and

Fig. 4 is a block diagram showing a circuit
arrangement of an automatic lens design system for
25 carrying out the lens preparing method according to
the invention.

Now, the invention will be described in
concrete by referring to Fig. 1. For making up a lens

- 6 -

0061918

- 1 for glasses or spectacles, a peripheral edge portion of
a polished lens 1-3 having a predetermined diameter is
abraded or removed away for copying a profile of a lens
mode 1-4 to thereby remove portions 1-2 and 1-2'
- 5 indicated by hatched area, so that the finished lens
can be fitted in a rim or frame. Thus, in the case of
the lens for spectacles and in particular in the case of
a convex lens, the processed lens thus presents a thicker
peripheral edge. The spectacles prepared from such
- 10 lenses fitted in a frame is not only lacking in smartness
but heavy in weight, imposing a burden on the user. In
an effort to evade such inconvenience, it has been
attempted to start the lens processing from a raw lens
having a smaller diameter. However, this means that
- 15 selection of the frame or rim is undesirably restricted,
making it difficult or impractical to use a frame of an
increased size now in fashion.

Accordingly, it is contemplated with the
invention to provide an apparatus for measuring with

20 a high accuracy the lens model or frame model, whereby
informations of the lens model concerning the shape and
dimension are inputted to a computer together with
optometrical information obtained through eye-examination
of a user to thereby determine arithmetically various

25 optical characteristics such as sphere power, cylinder
power, prism power, cylinder axis, decentralization and
so forth in accordance with a design program stored
previously in the computer. The lens is made up or

- 7 -

0061918

1 abraded in accordance with the data thus obtained to
thereby prepare a lens having an optimal thickness and
thus suited for being fitted in a desired frame, as is
illustrated in Fig. 2.

5 Next, description will be made on a method of
measuring shape and dimension of a lens model or
profile model according to the teaching of the present
invention by referring to Figs. 3 and 4. The shape and
size or dimension of selected frame is copied in a lens
10 model (usually made of a plastic flat plate) which is then
fixedly placed on a lens model supporting plate (not
shown) disposed above a motor 3-5. Subsequently,
electromagnetic length measuring scale instruments 3-2
and 3-3 are brought into contact with peripheral edge
15 portions of the lens model. In this case, care should
be taken so that the lens model be positioned in a
predetermined starting disposition. Usually, the lens
model is located with the upper side atop. Subsequently,
a power supply circuit shown in Fig. 4 is closed to
20 initiate the operation of the motor 3-5 interlocking
with the lens model. Rotation angle of the motor shaft
is detected by a rotary encoder 3-4 which is operatively
coupled to a gear wheel 3-6 mounted fixedly on the motor
shaft by way of an interposed gear wheel 3-7 and is
25 supplied to a computer through an angle counter circuit
3-4. The length measuring instruments are placed
continuously in contact with the periphery of the
rotating lens model and adapted to measure the distance

- 8 -

0061918

1 R between the center and the periphery of the lens
model as well as the distance R' between the meridian
(A-A') and a scale plate MP connected to the electro-
magnetic measuring instrument 3-3, as the result of
5 which detection signals representative of the point
displacement (R) and the area displacement (R') are
produced from the electromagnetic measuring instruments
3-2 and 3-3. These detection signals are supplied to
a signal processing circuit 3-11 by way of a counter
10 circuit to be combined into a synthesized signal which
is then supplied to the computer 3-12 together with the
rotation angle signal mentioned above.

Additionally, optometrical information obtained
through eye-examination is converted into signals
15 representative of the various optical characteristics
mentioned above in accordance with a predetermined
program to be used in the computer together with the
measurement data derived from the measurements of the
lens model for arithmetic operation executed in accordance
20 with a previously prepared lens designing program to
thereby obtain data such as convex and concave curvatures,
center thickness excentricity, diameter and the like
required for processing the lens so that a minimum
lens thick can be attained. The making-up or processing
25 of the lens is conducted on the basis of the data thus
obtained. The finished lens then presents a minimum
thickness and a minimum diameter and can be snugly
fitted in a selected frame with removal quantity of-

- 9 -

0061918

- 1 the peripheral portion through abrading being decreased
to a minimum.

In this way, preparation of the lens can be accomplished with an enhanced precision by virtue of the
5 arithmetic processing of the measurement data and the optometrical data by the electric computer, whereby there is obtained a lens which can be snugly fitted in a selected frame and presents a light weight as well as smartness.

- 10 Fig. 4 shows in a block diagram a circuit arrangement for carrying out the lens preparing method according to the invention with emphasis being put on a circuitry for measuring the lens model. The apparatus for measuring the lens model copying a selected frame
15 comprises a lens model rotating unit, a detecting unit and a display unit. Ends of movable contact rods of the electromagnetic measuring instruments 3-2 and 3-3 are brought into contact with the lens model in the manner described hereinbefore, and data as required
20 are read out from a digital display. As the motor is driven, the lens model is rotated at a low speed, whereby the contact rods of the electromagnetic measuring scale instruments are displaced by following the profile of the lens model. On the other hand, the
25 rotation angle with reference to a horizontal center axis is recorded in an angular distance of 2° to 5°, while the linear displacements of the contact rods are measured by means of potentiometers or linear encoder.

- 10 -

0061918

1 Thus, informations of the lens model such as rotation
angle, point displacement and area displacement are
obtained in a polar coordinate display. The circuit
includes interfaces for directly loading data into the
5 computer 3-12 in addition to the digital display and a
digital printer so that the data processing can be
carried out at a high speed in accordance with the
automatic lens design program.

In this connection, it is noted that prepara-
10 tion of the design data table is impossible with only
prescription by the ophthalmologist. Further, the appro-
priate lens design can be accomplished satisfactorily
only when the frame profile is considered in addition
to the prescription by the ophthalmologist. The
15 approximate expression adopted heretofore is substantially
of no use to this end. Accordingly, there exists a
demand for the automatic lens design program which is
so prepared as to allow the high speed processing with
an enhanced accuracy.

20 According to the invention, the apparatus for
measuring the lens model is combined with an appropriate
computer such as, for example, Model ICUA-AA available
from Fujitsu Co. in Japan, whereby the lens processing
data table is prepared through arithmetic operation on
25 the measurement information of the lens model and the
prescription data loaded in the computer. Cutting and
abrading of a raw lens are then executed on the basis
of the data table thus obtained to thereby prepare

- 11 -

0061918

- 1 the lens for glasses which can be snugly fitted in a desired frame and has a minimum peripheral thickness.

- 12 -

0061918

WHAT IS CLAIMED IS:

1. A method of manufacturing a lens for spectacles on the basis of an automatic designing program prepared in accordance with a recipe; comprising the steps of: preparing an automatic lens design program in accordance with a prescription for a user; obtaining frame information of a desired frame in which finished lenses are to be fitted on the basis of a lens model (3-1); deriving optimum lens design data through processing of said frame information by a computer (3-12) in accordance with said lens design program; and preparing and finishing a lens by cutting, abrading or the like processing of a lens material (1-3) in accordance with said optimum lens design data.
2. A method of manufacturing lenses to be fitted in a frame of spectacles on the basis of an automatic design program prepared in accordance with a recipe prescribed for a user, comprising the steps of: preparing first the automatic design program in accordance with the recipe prescribed for the user; obtaining information of a lens frame from a lens model (3-1); processing said frame information in accordance with said automatic lens design program by a computer (3-12) to thereby make available optimum lens design information; and processing a lens in accordance with said optimum lens design information by cutting and abrading a raw material (1-3) of the lens.
3. A method of manufacturing spectacles on the

- 13 -

0061918

basis of an automatic design program prepared in accordance with a recipe prescribed for a user, comprising the steps of preparing first an automatic lens program in accordance with recipe prescribed for the user; obtaining desired information of a frame in which the lenses are fitted with the aid of a lens model (3-1); designing optimum lens by processing said frame information in accordance with said program by a computer (3-12), processing a lens material in accordance with data available from the output of said computer (3-12); and fitting the finished lenses in the frame.

0064918

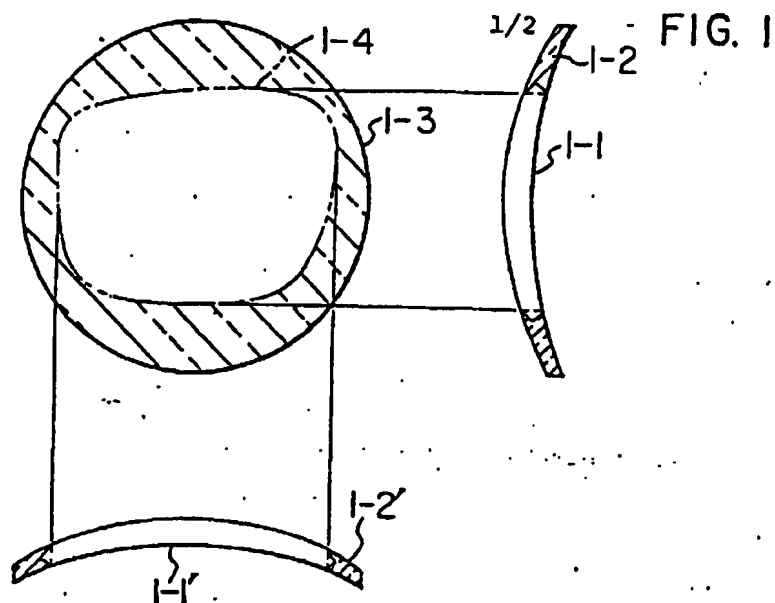


FIG. 2

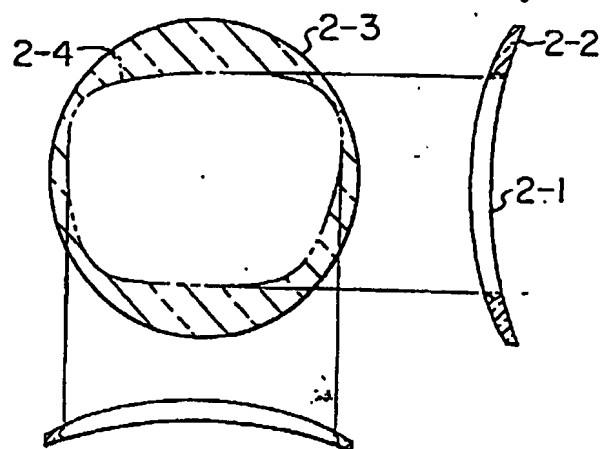


FIG. 3.

